REMARKS

Claims 1 to 14 are all the claims pending in the application, prior to the present Amendment.

Claim 2 has been rejected under the second paragraph of 35 U.S.C. § 112 as indefinite.

In essence, the Examiner maintains the previous rejection of claim 2 as indefinite because it describes a system of two equations with four unknown parameters.

In addition, claim 1 has been rejected under the second paragraph of 35 U.S.C. § 112 as indefinite.

The Examiner states that the term "previously obtained relationship" is not described with sufficient specificity in the claims or the specification, for the same reasons that the Examiner set forth above in connection with the rejection of claim 2.

In response, applicant has amended claim 1 to incorporate recitations from claims 2 and 14. Applicant has canceled claims 2 and 14.

Applicant submits that claim 1 as amended above complies with the requirements of the second paragraph of 35 U.S.C. § 112, and, accordingly, requests withdrawal of the rejection.

In amending claim 1, applicant has deleted the term "previously obtained relationship," and has amended claim 1 to now recite "previously obtaining" a formula that contains the constants A and B. In addition, claim 1 now relates the specific surface S to firing temperature.

As applicants explained previously, constants A and B can be determined by selecting two cerium carbonates having specific fluorine contents Fl and F2 in a range of 10-500 ppm by mass. The determining of A and B is achieved by firing the cerium carbonate having fluorine content Fl at a certain firing temperature t_1 in a predetermined furnace under predetermined

firing conditions, determining the specific surface area of the obtained cerium oxide, and selecting the firing temperature t_1 as the firing temperature Tl if the specific surface area of the cerium oxide is in a range of 9.5 to 12.2 m^2/g. If the specific surface area of the cerium oxide is not in a range of 9.5 to 12.2 m^2/g, firing the cerium carbonate at firing temperature t_2 different from firing temperature t_1 in the predetermined furnace under the predetermined firing conditions, and selecting the firing temperature t_2 as the firing temperature T1 if the specific surface area of the cerium oxide is in a range of 9.5 to 12.2 m^2/g. The above procedures are repeated for another cerium carbonate having fluorine content F2 to select firing temperature T2.

Since constants A and B can be definitely determined in accordance with the above procedures, the formula $T = (700 + A) - B[\log(F)]$ includes only two variants if the firing furnace and firing conditions other than the firing temperature are set. Therefore, if cerium carbonate having fluorine content F is given, the optimum firing temperature for the cerium carbonate to be fired can be determined from the above formula.

In view of the above, applicant submits that claim 1 as amended above complies with the requirements of the second paragraph of 35 U.S.C. § 112, and, accordingly, requests withdrawal of the rejection.

Claims 1, 2 and 14 have been rejected under 35 U.S.C. § 103(a) as obvious over JP 2003-082333 to Uchino et al.

The present rejection is essentially the same as the previous rejection of the claims over Uchino et al.

As discussed above, applicants have amended claim 1 to incorporate certain recitations from claims 2 and 14, and have canceled claims 2 and 14, thus leaving claim 1 as being subject to this rejection.

Applicant submits that JP 2003-082333 to Uchino et al does not disclose or render obvious the presently claimed invention as set forth in claim 1 and, accordingly, requests withdrawal of this rejection.

The present invention resides in a method for setting a firing temperature of cerium carbonate which is to be fired to produce a cerium oxide abrasive, the cerium carbonate having a fluorine content falling within a range of 10 to 500 ppm, and comprises the step of setting the firing temperature in accordance with the fluorine content.

In the present invention, the firing temperature of cerium carbonate is set depending on the fluorine content of the cerium carbonate to be fired, and the firing temperature of cerium carbonate to be set is calculated from the formula: $T = (700 + A) - B[\log(F)]$ which is previously obtained for the particular firing furnace in which the firing occurs.

The present inventor found that the quality, particularly the specific surface area, of the cerium oxide obtained by firing cerium carbonate depends on the fluorine content of cerium carbonate which has a fluorine content in a range of 10 to 500 ppm by mass, and the fluorine content of the starting cerium carbonate varies very much. Therefore, if the firing temperature of the cerium carbonate is set to a certain temperature, the quality of the cerium oxide obtained varies very much.

Uchino et al disclose a calcining temperature of cerium carbonate in a range of 400-800°C, as disclosed in paragraph [0044], and disclose in Table 2 a fluorine concentration of

cerium based abrasive after roasting in a range of 0.02-0.14 wt%, i.e., 200-1400 ppm by weight. The roasting temperature in Table 2 is from 850 to 1020°C, which is outside the firing range of the claim 1. Uchino et al further disclose in Table 4 a roasting temperature range of 750 to 1050°C. Uchino et al further disclose in paragraph [0035] that the roasting temperature is preferably 800 to 1200°C, and in paragraph [0035] teaches away from a roasting temperature less than 800°C.

The Examiner has taken the view that the firing temperature range and the fluorine concentration range of Uchino et al overlap with those of the present invention, and the optimization of the firing temperature is not inventive since it is obtained by routine experimentation.

However, the present invention is not the optimization of the firing temperature disclosed in Uchino et al. If the firing temperature disclosed in Uchino et al is optimized, once the firing temperature in Uchino et al is set to a certain optimized firing temperature, this set firing temperature is not changed in Uchino et al and does not depend on the fluorine content of each cerium carbonate to be fired. As a result, the quality of the cerium oxide obtained varies very much. In contrast, in the present invention, the firing temperature of cerium carbonate to be fired is determined for each cerium carbonate to be fired and is changed depending on each cerium carbonate or the fluorine content of each cerium carbonate, by which uniform quality is attained in the fired cerium oxide.

This technical idea of the present invention is not disclosed or suggested in Uchino et al. Therefore, applicant submits that the present invention is not the optimization of the firing temperature disclosed in Uchino et al and is patentable over Uchino et al.

With respect to the previously amended claim 1, the Examiner asserts that Uchino et al teach fluorine content, firing temperature, and surface area of the various examples in the Experimental Tables. The Examiner states that a relationship exists in Uchino et al between the fluorine content and temperature. The Examiner states that the firing temperature is generally higher in the examples that use a material with a smaller fluorine content value, and one would be motivated to operate under similar conditions as those disclosed by Uchino et al to obtain the appropriate abrasive composition.

Applicants point out that the Examiner does not explain what examples she is relying on to support her statement that that the firing temperature is generally higher in the examples that use a material with a smaller fluorine content value. It is not clear whether the Examiner is referring to the fluorine content of the raw material that is to be fired, or the fluorine content of the fired material.

The Examiner's allegation that the firing temperature in Uchino et al is generally higher in the examples that use a material with a smaller fluorine content value, has no basis. There is a possibility that the Examiner is referring to the fluorine content from Tables 2 and 4, which is a fluorine content of the cerium oxide in a slurry after firing and pulverization, which is different from the fluorine content of starting cerium carbonate to be fired. If the firing temperature is higher, vaporization of fluorine is greater during the firing and the fluorine content of the resultant cerium oxide is lower. However, this technical matter that the Examiner alleged has no technical relation with the present invention.

With respect to the recitation of a temperature of 690 to 780°C set forth in claim 1, the Examiner asserts that the various examples of Uchino et al show roasting temperatures within the

claimed range. In particular, the Examiner refers to Table 4 and Table 5 which disclose a roasting temperature of 750°C for Specimen No. 5. The Examiner argues that generally, differences in temperature will not support the patentability of subject matter encompassed by the prior art, unless there is evidence indicating such a temperature is critical.

Applicants point out, however, that the 750°C in Specimen No. 5 of Table 4 of Uchino et al produced a specific surface area of 16.7 m^2/g, which is higher than the 9.5 to 12.2 m^2/g specific surface area that is set forth in amended claim 1. In Table 4 of Uchino et al, higher roasting temperatures outside the 690 to 780°C range of claim 1 were required to obtain specific surfaces that are within the range of amended claim 1.

A review of the data in Tables 2 and 4 of Uchino et al shows that Uchino et al nowhere suggest the combination of a firing temperature of 690 to 780°C and a specific surface area of 9.5 to 12.2 m^2/g. Specimen Nos. 1 and 4 and Comparative Example 1 of Table 2 of Uchino et al and Specimen Nos. 7 and 8 of Uchino et al are the only examples of specific surface areas within the scope of claim 1, but in each of these examples, the firing (roasting) temperature was 850°C or higher, which is outside that scope of and higher than the firing temperature of 690 to 780°C of claim 1. Specimen No. 5 of Uchino et al is the only Specimen that employed a firing temperature that is within the range of the firing temperature set forth in claim 1, but Specimen No. 5 produced a specific surface area of 16.7 m^2/g, which is higher than the 9.5 to 12.2 m^2/g specific surface area that is set forth in amended claim 1.

Thus, there is no combination in the examples of Uchino et al which discloses or suggests the combination set forth in claim 1.

The Examiner states that applicant has argued that the cerium carbonate of the present invention is commercially available with an impurity content of less than 100 ppm, and not subject to a fluorination treatment.

The Examiner responds by stating that Table 1 of Uchino et al teaches Specimens 1 and 2, with a fluorine content within the claimed ranges, and not subjected to a fluorination treatment. The Examiner states that the process of obtaining this carbonate precursor does not impart any special characteristics to the process, as claimed.

Applicants disagree with the Examiner's assertion that Specimens 1 and 2 of Table 1 have a fluorine content within the claimed range. Specimens 1 and 2 of Table 1 were not subject to a fluorination treatment, but contained fluorine as part of the raw material. Paragraph [0048] discloses a fluorine content of 0.16%, which corresponds to 1,600 ppm. This raw material was subjected to prepulverization, a main pulverization and heating before roasting, but Uchino et al nowhere disclose the fluorine content of such a pulverized and heated material which constitutes Specimens 1 and 2. Table 2 of Uchino et al disclose fluorine contents of 0.02 and 0.014%, but these fluorine contents are the fluorine content of the roasted (fired) cerium abrasive product, and not that of the starting cerium carbonate.

The Examiner states that applicant has argued that the fluorine content in the starting rare earth carbonate of Uchino et al is 1600 ppm.

The Examiner responds by stating that this is the fluorine content of the Uchino et al material before processing steps (pulverization, slurrying, heating) which occur before the roasting step, and is not considered the fluorine content of the "cerium carbonate to be fired."

The Examiner, however, does not state what she believes is the fluorine content of the "cerium carbonate" to be fired. The Examiner nowhere states how Uchino et al satisfy the recitation of claim 1 of a cerium carbonate having a fluorine content of 10 to 500 ppm.

A general feature of the present invention is that the starting cerium carbonate used in the present invention is pure or has low impurities. This is a basic difference of the present invention from Uchino et al.

In view of the above, applicant submits that Uchino et al do not disclose or render obvious the presently claimed invention and, accordingly, request withdrawal of this rejection.

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,

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